A STUDY ON DEMOGRAPHIC, ETIOLOGICAL, CLINICAL PROFILE AND COMPLICATIONS IN PATIENTS WITH CHRONIC KIDNEY DISEASE IN GGH, CHENNAI

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CERTIFICATE

This is to certify that the dissertation entitled "**A STUDY ON DEMOGRAPHIC, ETIOLOGICAL, CLINICAL PROFILE AND COMPLICATIONS IN PATIENTS WITH CHRONIC KIDNEY DISEASE IN GGH, CHENNAI**" is a bonafide work done by **Dr. SWARAJ SATHYAN**, at Madras Medical College, Chennai in partial fulfillment of the university rules and regulations for award of M.D., Degree in General Medicine (Branch-I) under my guidance and supervision during the academic year 2006-2009.

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DECLARATION

I solemnly declare that this dissertation entitled "**A STUDY ON DEMOGRAPHIC, ETIOLOGICAL, CLINICAL PROFILE AND COMPLICATIONS IN PATIENTS WITH CHRONIC KIDNEY DISEASE IN GGH, CHENNAI**" was done by me at Madras Medical College and Government General Hospital, during 2006-2009 under the guidance and supervision of **Prof. M. JUBILEE, M.D.** This dissertation is submitted to the Tamil Nadu Dr.M.G.R. Medical University towards the partial fulfillment of requirements for the award of M.D. Degree in General Medicine (Branch-I).

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CONTENTS

INTRODUCTION

Chronic kidney disease is characterized by a decrease in glomerular filtration rate and histological evidence of reduction in nephron population. The clinical course is typically one of a progressive and unrelenting loss of nephron function ultimately leading to end stage renal disease. Kidney failure is the most visible aspect of the spectrum, but it represents only a minority of the total population affected by kidney disease.

The time between initial onset of disease and development of terminal renal failure may vary considerably not only between different diseases but also in different patients with similar disease processes. The progressive nature of CKD and the ensuing ESRD is putting a substantial burden on global health resources since all modalities of treatment are expensive.

There are multiple causes of kidney injury that lead to the final common pathway of ESRD, and this syndrome is characterized by hypertension, anemia, renal bone disease, nutritional impairment, neuropathy, impaired quality of life, and reduced life expectancy. Increasing evidence acquired in the past decades indicates that the adverse outcomes of

CKD such as renal failure, cardiovascular disease, and premature death can be prevented or delayed by early detection of CKD. Earlier stages of CKD can be detected through laboratory testing only. Treatment of earlier stages of chronic kidney disease, as well as initiation of treatment of cardiovascular risk factors at early stages of CKD should be effective in reducing the rate of progression of CKD to ESRD.

Unfortunately, despite the evident importance of CKD there is limited data on its epidemiology within the general population, especially from developing countries like India. Two community-based studies have shown a prevalence of chronic renal failure of 0.16%[1] and 0.79%[2]. Renal failure registry data is unlikely to be representative of the broader spectrum of CKD. There is a wide variability both within and between countries in the occurrence, clinical characteristics and outcomes of patients with kidney failure and there have been substantial changes over time. Only 3% to 5% of all patients with ESRD in India get some form of renal replacement therapy[3]. Thus, planning for prevention of CKD on a long-term basis is the only practical solution for India.

This study was taken up to highlight the epidemiological characteristics, clinical presentation, etiology, complications and outcome of patients who presented with CKD to a Government tertiary care hospital.

AIMS AND OBJECTIVES

To study

1. the demographic and clinical profile of patients with Chronic kidney disease.

2. the etiological diagnosis, risk factors and complications of patients with Chronic kidney disease.

3. the treatment options given to patients with Chronic kidney disease.

4. the correlation of risk factors and complications with respect to staging of Chronic kidney disease.

REVIEW OF LITERATURE

CHRONIC KIDNEY DISEASE

Chronic kidney disease represents the entire spectrum of disease that occurs following the initiation of kidney damage. The introduction of a formal definition for CKD has enabled standardize current medical communication, facilitate appropriate population based screening, and encourage timely prevention and treatment of kidney disease.

DEFINITION[4]

1. Kidney damage for $\geq$ 3 months, as defined by structural or functional abnormalities of the kidney, with or without decreased GFR, manifest by either
    - Pathological abnormalities; or
    - Markers of kidney damage, including abnormalities in the composition of the blood or urine, or abnormalities in imaging test.

2. GFR < 60 mL / min / 1.73 m^2 for $\geq$ 3 months, with or without kidney damage.

The GFR is considered the best measure of overall kidney function. A GFR level below 60 mL / minute / 1.73 m^2 represents loss of one half or more of the adult level of normal kidney function. Normal GFR varies according to patient age, sex, and body size. The MDRD formula is a better estimate of GFR than those derived from 24-h urinary creatinine clearance or the Cockcroft-Gault formula. The abbreviated MDRD formula requires age, gender, race, and serum creatinine.

The Abbreviated MDRD Formula[5]

$eGFR = 186 \times ([SCR/88.4]^{-1.154)} \times (age)^{-0.203} \times (0.742 \text{ if female}) \times (1.210 \text{ if African-American})$

where

eGFR = estimated glomerular filtration rate (mL/min/1.73m^2),

SCR = serum creatinine concentration (μmol/L), and age is expressed in years

AGE

In young adults, the normal GFR is approximately 120 to 130 mL /minute / 1.73 m^2 and declines with age.[6] A decreased GFR in an elderly patient appears to be an independent predictor of adverse outcomes such as mortality and cardiovascular disease[7,8]. Because of the age-related decline in GFR, the prevalence of chronic kidney disease increases with age; approximately 17 percent of persons older than 60 years have an estimated GFR of less than 60 mL / minute / 1.73 m^2.

GENDER

Male gender has been recognized as an important factor in the development of CKD[9]. Gender-based genetic variability has been linked to differences in BP in both black[10] and white individuals[11]. Males may be more susceptible to CKD, which would explain the higher proportion in renal replacement therapy programmes. In contrast to testosterone, [12,13] estrogens may attenuate CKD progression by lowering the cardiovascular stress response to adrenergic stimuli[14].

Chronic kidney disease is a national public health problem beset by inequities in incidence, prevalence, and complications across race/ethnicity, and socioeconomic status.

SOCIOECONOMIC STATUS

In U.S, geographic analyses have revealed community-level poverty was strongly associated with higher ESRD incidence but was a more powerful predictor for black than for white individuals.[15] Racially divided communities may share low-income status but often differ in wealth, community assets, exposure to heavy metals or excess ambient air particulate matter, and other variables that may influence CKD-related outcomes.[16]

RACE

Racial factors also have a role in the susceptibility to CKD as shown by high prevalence of CKD related to hypertension, diabetes, or both, among Africans and native Americans in USA as well as Afro-Caribbean and Asian individuals in UK.[17] In U.S, ESRD rates in minorities ranged from 1.5 to 4 times those of age-adjusted counterparts, despite similar rates for the early stages of CKD.[18]

STAGING OF CHRONIC KIDNEY DISEASE

As patients pass through the continuum of progressive kidney damage, there are predictable complications, such as the development of anemia, and an elevated parathormone levels and predictable management issues such as dialysis access preparation. The NKF/ KDOQI staging system[4] for CKD was developed to address this need.

Stage	*Description*	*GFR (mL per minute per 1.73 m^2)*	*U.S. prevalence, number of affected patients (%)*	*Action plan*
-	At increased risk for chronic kidney disease	> 60 (with risk factors for chronic kidney disease)		Screening, reduction of risk factors for chronic kidney disease
1	Kidney damage with normal or elevated GFR	>= 90	5.9 million (3.3)	Diagnosis and treatment, treatment of comorbid conditions, interventions to slow disease progression, reduction of risk factors for cardiovascular disease
2	Kidney damage with mildly decreased GFR	60 to 89	5.3 million (3.0)	Estimation of disease progression
3	Moderately decreased GFR	30 to 59	7.6 million (4.3)	Evaluation and treatment of disease complications
4	Severely decreased GFR	15 to 29	400,000 (0.2)	Preparation for kidney replacement therapy (dialysis, transplantation)
5	Kidney failure	< 15 (or dialysis)	300,000 (0.1)	Kidney replacement therapy if uremia is present

EARLY KIDNEY DISEASE – STAGES 1 AND 2

For stages 1 and 2, kidney damage is detected by a ratio of greater than 17 mg of albumin to 1 g of creatinine in men or greater than 25 mg of albumin to 1 g of creatinine in women on two untimed (spot) urine tests. The key issue in this group of patients becomes identification of whether renal function is likely to decline. The patients who at significant risk of progressing[19] include proteinuria >1 g/day[20], poorly controlled blood pressure, certain underlying diagnoses like diabetic nephropathy, should be promptly evaluated and managed to decrease the risk of progression to End Stage Renal Disease (ESRD).

STAGE 3 CKD

Patients with stage 3 CKD have significant renal impairment and are probably the very group in whom renal failure is poorly recognised.[21] In patients with progressive renal failure, it is desirable to institute treatment to delay the need for dialysis. There is good evidence to support the efficacy of such measures in proteinuric patients.[22,23] The natural history of renal impairment in non-proteinuric patients, however, is not well-defined, and will depend at least in part on the underlying cause of renal damage. The large majority of these patients will not progress sufficiently to require

dialysis.[24] However, patients with stage 3 CKD have substantially increased cardiovascular risk compared to patients with better renal function, with a 43–100% increased risk of cardiovascular events[25] and most of them will die as a result of cardiovascular disease before ever needing dialysis.[26] Increased cardiovascular risk appears to start increasing as GFR declines below 75 l/min/1.73 m^2. [27] Management revolves around vigorous treatment of hypertension, particularly with blockade of the renin-angiotensin system, to a blood pressure <130/80 mmHg (<125/75 mmHg if proteinuria >1 g/day is present), and treatment of other cardiovascular risk factors.

STAGE 4 AND 5

These patients have marked disruption to normal physiology, causing complications such as renal anemia and renal osteodystrophy that require specialist management. These are also the stages at which preparations for dialysis and transplantation are required. Late referral of patients with advanced renal failure to nephrologists compromises the preparations for dialysis and subsequent survival of those patients[28] and is more costly than timely referral.[29] Even patients who are unsuitable for dialysis (or are unwilling to undergo it) will benefit from management of their anemia and bone disease, and potentially from palliative care.[30]

Kidney failure is defined as a GFR below 15 mL / minute / 1.73 m^2, usually accompanied by signs and symptoms of uremia, or as the need for initiation of kidney replacement therapy for management of the complications of a decreased GFR. In the United States, approximately 98 percent of patients begin dialysis when their GFR falls below 15 mL /minute / 1.73 m^2.[31]

The number of patients with end stage renal disease is growing worldwide. About 20-30 patients have some degree of renal dysfunction for each patient who needs renal replacement treatment.[32] Diabetes and hypertension are the two most common causes of end stage renal disease and are associated with a high risk of death from cardiovascular disease.[33] Early detection and treatment often can prevent or delay some of these adverse outcomes.[34] However, opportunities for prevention may be lost because chronic kidney disease is not diagnosed or is treated insufficiently[35,36] due to lack of uniform application of simple tests for the detection and evaluation of the disease.[37]

RISK FACTORS FOR CHRONIC KIDNEY DISEASE AND ITS OUTCOMES[4]

Type	Definition	Examples
Susceptibility factors	Factors that increase susceptibility to kidney damage	Older age, family history of chronic kidney disease, reduction in kidney mass, low birth weight, racial or ethnic minority status, low income or educational level
Initiation factors	Factors that directly initiate kidney damage	Diabetes mellitus, high blood pressure, autoimmune diseases, systemic infections, urinary tract infections, urinary stones, obstruction of lower urinary tract, drug toxicity
Progression factors	Factors that cause worsening kidney damage and faster decline in kidney function after kidney damage has started	Higher level of proteinuria, higher blood pressure level, poor glycemic control in diabetes, smoking
End-stage factors	Factors that increase morbidity and mortality in kidney failure	Infection, cardiovascular factors, anemia, low serum albumin level, late referral for dialysis

ETIOLOGY

Diagnosis of chronic kidney disease traditionally is based on pathology and etiology, broadly divided into diabetic, glomerular, vascular, tubulointerstitial, and cystic kidney diseases.

ETIOLOGY	WHITES*	BLACKS*	ASIAN AMERICANS*	INDIANS**
Diabetes mellitus	43.5%	42.1%	42.6%	27.4%
Hypertension	24%	32.9%	23.5%	15.5%
Glomerulonephritis	12%	10.4%	17.3%	19.3%
Interstitial nephritis	4.8%	2.0%	2.9%	8.6%
Cystic disease/hereditary	3.8%	1.5%	2.2%	3.9%
Miscellaneous	6.2%	6.0%	2.4%	12.1%
Unknown	5.7%	5.1%	5.5%	13.2%
TOTAL	100%	100%	100%	100%

*USRDS Data 2001

**All India CKD Registry of the Indian Society of Nephrology

In developing countries, evidence is lacking regarding the etiology of CKD because of poor data collection. Infectious diseases and infection related chronic glomerulonephritis form a major cause of CKD and end stage renal disease.[38] In spite of this, it is believed that diabetes and hypertension are the leading causes of CKD in India.

RISK FACTORS FOR CKD

DIABETES

In the United States, diabetic kidney disease is the most common cause of kidney failure. It accounts for nearly 45% of all new cases of ESRD starting renal replacement therapy between 1996 and 2006. Its earliest manifestation is microalbuminuria with a normal or elevated GFR. Effective control of blood glucose and blood pressure reduces the renal complications of diabetes. Meticulous control of blood glucose has been conclusively shown to reduce the development of microalbuminuria by 35% in type 1 diabetes (Diabetes Control and Complications Trial)[39] and in type 2 diabetes (United Kingdom Prospective Diabetes Study).[40] Other studies have indicated that glycemic control can reduce the progression of diabetic renal disease.[41]

Adequate control of blood pressure with a variety of antihypertensive agents, including angiotensin converting enzyme inhibitors, has been shown to delay the progression of albuminuria in both type 1 and type 2 diabetes[42,43] Recently, angiotensin receptor blockers have been shown to have renoprotective effects in both early and late nephropathy due to type 2 diabetes.[44]

HYPERTENSION

Hypertension is the second most common cause of ESRD in the United States, accounting for 23% of incident ESRD patients between 1996 and 2000.[45] Hypertension is a well established cause, a common complication, and an important risk factor for progression of renal disease. Controlling hypertension is the most important intervention to slow the progression of renal disease. Angiotensin converting enzyme inhibitors are particularly effective in slowing progression of renal insufficiency in patients with and without diabetes.[46] Angiotensin receptor blockers have a renoprotective effect in diabetic nephropathy, independent of reduction in blood pressure.[50]

Non-dihydropyridine calcium channel blockers also have a role in retarding progression of renal insufficiency in patients with type 2 diabetes. Early detection and effective treatment of hypertension to target levels is essential. Hypertension is the most common complication of CKD. Hypertension is more difficult to control in patients with CKD. In one study, only 11% of CKD patients had BP levels lower than 130/85 mm Hg; 27% of these patients had a BP that was lower than 140/90 mm Hg; and 62% of them had a BP that was higher than 140/90 mm Hg.[48]

PROTEINURIA

Proteinuria, previously considered a marker of renal disease, is itself pathogenic and is the single best predictor of disease progression. Reducing urinary protein excretion slows the progressive decline in renal function in both diabetic and non-diabetic kidney disease. Angiotensin blockade with angiotensin converting enzyme inhibitors or angiotensin receptor blockers is more effective at comparable levels of blood pressure control than conventional antihypertensive agents in reducing proteinuria, decline in glomerular filtration rate, and progression to end stage renal disease.[49]

DYSLIPIDEMIA

Lipid abnormalities may be evident with only mild renal impairment and contribute to progression of chronic renal disease and increased cardiovascular morbidity and mortality. Hydroxymethyl glutaryl coenzyme A reductase inhibitors (statins) decreased proteinuria and preserved glomerular filtration rate in patients with renal disease, an effect not entirely explained by reduction in blood cholesterol.[50]

HYPERURICEMIA

A link between hyperuricemia and the development of systemic hypertension, cardiovascular disease, and renal disease has also been postulated.[51]

OBESITY

Obesity has been associated with initiation and progression of glomerulonephritis.[52,53] Among NHANES III participants, the risk of either incident ESRD or kidney disease related death was independently a body mass index greater than or equal to 35 kg/m^2.[54] Obese people were more likely to have a decrease in estimated GFR.[55]

CIGARETTE SMOKING

Cigarette smoking has been implicated in initiation as well as progression of CKD. The incidence of ESRD was increased by 5.9 times among heavy smokers (>15 pack years).[56] In another study, heavy smokers (> 20 pack years) had a risk of developing albuminuria three times that of non-smokers.[57] Smoking cessation alone may reduce the risk of disease progression by 30% in patients with type 2 diabetes.[58] Smoking increases the risk of cardiovascular events in men with kidney disease.[59]

ALCOHOL

Regular and heavy (> two drinks daily) consumption of alcohol might also increase the risk of ESRD.[60]

ANALGESIC ABUSE

Consumption of analgesics, especially paracetamol and NSAIDs have been linked with a higher risk of developing CKD.[61]

COMPLICATIONS OF CHRONIC KIDNEY DISEASE

ANEMIA

Anemia of chronic renal disease begins when the glomerular filtration rate falls below 30-35% of normal and is normochromic and normocytic. This is primarily caused by decreased production of erythropoietin by the failing kidney,[62] other factors contributing to anemia include inhibitors of erythropoiesis, shortened RBC life span, platelet dysfunction, decreased iron intake, and secondary hyperparathyroidism. Anemia is an independent predictor of mortality and has also been associated with increased morbidity in CKD. Correction of anemia improves the quality of life, cognitive and sexual function, reversal of ST-T changes on ECG, and reversal as well as prevention of left ventricular hypertrophy, reduces the frequency of heart failure and hospitalization among patients receiving dialysis.[63,64] Whether anemia accelerates the progression of renal disease is controversial. Treatment of anemia with recombinant human erythropoietin may slow progression of chronic renal disease.[65]

Both National Kidney Foundation and European best practice guidelines recommend evaluation of anemia when hemoglobin is <11 g/dl and consideration of recombinant human erythropoietin to maintain a target

hemoglobin of >11 g/dl.[66] But when The United States Normal Hematocrit study evaluated 1,233 hemodialysis patients with clinical evidence of congestive heart failure or ischemic heart disease, the risk ratio (for death and non-fatal myocardial infarction) was 1.3 for the normal hematocrit group as compared to the low hematocrit group.[67]

HYPERPHOSPHATEMIA AND HYPERPARATHYROIDISM

Hyperparathyroidism is one of the earliest manifestations of impaired renal function,[68] found in patients with a glomerular filtration rate of 60 ml/min.[69] Parathormone is a major uremic toxin that causes bone disease, metastatic calcification, pruritus, encephalopathy, peripheral neuropathy, anemia, sexual dysfunction, and hyperlipidemia. Control of serum phosphate levels is a central goal in the management of chronic renal failure. Precipitation of calcium phosphate in renal tissue begins early, may influence the rate of progression of renal disease, and is closely related to hyperphosphatemia and calcium phosphate product. This plays a pivotal role in vascular calcification, CVD, calciphylaxis, and death. A calcium-phosphorus product greater than 72 mg^2/dL[70] is associated with a 34 percent increase in mortality as compared to a product of 45 to 52 mg^2/dL.[71]

Elevated serum phosphate is an independent risk factor for death due to cardiovascular events by enhancing vascular calcification of atherosclerotic plaques and increased myocardial calcification. Patients with serum phosphate levels greater than 6.5 mg/dL have a 41% greater risk of death resulting from coronary artery disease and a 20% greater risk of sudden death as compared with patients with serum phosphate levels between 2.4 and 6.5 mg/dL after adjusting for several known mortality risk factors.[68]

MALNUTRITION

The prevalence of hypoalbuminemia is high among patients beginning dialysis, is of multifactorial origin, and is associated with poor outcome. Hypoalbuminemia may be a reflection of chronic inflammation rather than of nutrition in itself. Spontaneous intake of protein begins to decrease when the glomerular filtration rate falls below 50 ml/min. Progressive decline in renal function causes decreased appetite, thereby increasing the risk of malnutrition.

CARDIOVASCULAR DISEASE

The prevalence, incidence, and prognosis of clinical cardiovascular disease in renal failure is not known with precision, but it begins early and is independently associated with increased cardiovascular and all cause mortality.

RISK FACTORS ASSOCIATED WITH CARDIAC DISEASE[73]

Traditional

Age	Gender	Race
Smoking	Diabetes	Body mass index
Hypertension	Dyslipidemia	Left ventricular hypertrophy

CKD-related risk factors

Anemia	Calcium phosphate	Cytokines
Electrolyte imbalance	Malnutrition	Hypoalbuminemia
Inflammation	C-reactive protein	Endothelial activation
Prothrombotic factors	Increased oxidative stress	
Hyperhomocysteinemia	Advanced glycation end-products	

Therapy-related

Dialysis Transplant– Acute rejection

– Immunosuppressives

Cardiac disease, including left ventricular structural and functional disorders, is an important preventable and potentially treatable comorbidity of early kidney disease.[74] Patients with chronic kidney disease should be considered in the "highest risk" group for subsequent cardiovascular events[75] and appropriately managed.[79]

TREATMENT PRINCIPLES

1. Hypertension is both a cause and a complication of chronic kidney disease and should be carefully controlled in all patients
2. Treatment of co morbid conditions, interventions to slow progression of kidney disease, and measures to reduce the risk for CVD should begin during stage 1 and stage 2.
3. Evaluation and treatment of other complications of decreased GFR, such as anemia, malnutrition, bone disease, neuropathy, and decreased quality of life, should be undertaken during stage 3, as the

prevalence of these complications begins to rise when GFR declines to less than 60 mL/min per 1.73 m^2.

4. Preparation for kidney replacement therapy should begin during stage 4, well before the stage of kidney failure.
5. Initiation of dialysis and transplantation is triggered by the onset of uremic symptoms. Preparations for these treatments should begin when GFR declines to less than 15 mL/min per 1.73 m^2 (stage 5).

SIGNS AND SYMPTOMS IN CHRONIC KIDNEY DISEASE

General

Fatigue and malaise

Edema (peripheral and periorbital)

Decreased urine output in late stages

Cardiac

Hypertension

Dyspnea

Heart failure

Fluid overload

Markers of accelerated atherosclerosis

Pericarditis

Gastrointestinal

Anorexia

Nausea

Vomiting

Bleeding

Dysguesia

Constipation

Neuromuscular

Restless legs syndrome | Muscle cramps

Impaired cognition | Seizures

Peripheral neuropathy | Loss of lean body mass

Bone pain

Dermal

Pallor | Pruritus

Ecchymosis

Ophthalmologic

Fundoscopic changes of hypertension and diabetes

PREVIOUS RELATED STUDIES

CKD Registry of India data collected from many centres all over India, 25714 CKD patients were studied with a mean age of 48.3±16.6years, 68.9% males, 2.2 percent were in stage 1, 4.4 percent in stage 2, 19.1 percent in stage3, 24 percent in stage 4 and 50.3 percent in stage 5, irrespective of educational status or family income. Diabetic nephropathy was the most common etiology (30.3%), CGN (15.8%) and hypertensive nephrosclerosis (14.5%) the next common diagnoses. Majority (76.9%) were managed

conservatively, dialysis with MHD in 17.9%, CAPD in 2.7% and transplantation in 2.5%. Cardiovascular disease increased from 0.6% in stage 1 to 51% in stage 5 with IHD being the commonest (44.2%) and LVH in 31.6%. Anemia (hemoglobin <11g/dl) was present in 67.4% in stage 1 which increased to 98.7% in stage 5.

In NHANES Study[77] 1999-2004, the total crude CKD prevalence estimate for adults aged ≥20 years in the United States was 16.8%. [stage 1,5.7%; stage 2, 5.4%; stage 3, 5.4%; stages 4/5, 0.4%]. 39.4% were ≥60 years, 12.6% aged 40-59 years and 8.5% were in the age group 20-39 years. CKD (all stages) was more prevalent among persons with less than a high school education (22.1%) than persons with at least a high school education (15.7%). CKD prevalence also was greater among persons with diabetes (40.2% versus 15.4%), with cardiovascular disease (28.2% versus 15.4%), with hypertension (24.6% versus 12.5%), among non-Hispanic blacks (19.9%) and Mexican Americans (18.7%) than among non-Hispanic whites (16.1%). This racial/ethnic disparity was most pronounced among participants with stage 1 CKD.

In an etiopathological study done over a 6 year period in CMC Vellore[78] on 457 CKD patients in stage 4 and stage 5, excluding diabetic nephropathy, with a mean age of 38.2±14.5years, 62% males, the most common etiology of CKD by renal biopsy study was glomerular disease 322 (70.5%), followed by interstitial nephritis 55 (12%), benign arterionephrosclerosis 30 (6.6%), metabolic nephropathies 28 (6.1%), end-stage parenchymal disease 12 (2.6%) and other 10 (2.2%). There was no significant difference in the incidence of etiologies among patients with CKD stage 4 and stage 5.

In a cross-sectional study done over 2 years on 230 CKD patients (160 males, 70 females), with mean age of 53.55 years in a tertiary care centre in Chennai,[79] 51% of the patients in CKD stages I, II and III had anemia (Hb<11gm/dl), 16%in the group had elevated PTH, 79% of male patients and 71% of female patients had LVH. In Stage IV CKD, 55% of the patients had anemia, 25% of the patients had elevated PTH, 74% of male patients and 100% of female patients had LVH. In stage V CKD, 76% of the patients had anemia, 31% of the patients had elevated PTH, 77% of male patients and 96% of female patients had LVH. In all five stages, 78% of male patients and 71% of female patients with elevated PTH had LVH, 81%

of male patients and 90% of female patients with anemia had LVH. Systemic hypertension was present in 69% of the patients. Of the male patients, 82% with Hb < 7 gm/dl, 80% with Hb between 7.1-11 gm/dl and 68% with Hb > 11 gm/dl had LVH. Similarly among female patients, 91% with Hb < 7gm/dl, 89% with Hb between 7.1-11 gm/ dl, and 63% with Hb >11 gm/dl had LVH.

MATERIALS AND METHODS

SETTING

Patients attending the Nephrology department, Madras Medical College and Government General Hospital, Chennai

COLLABORATION DEPARTMENTS

Institute of Internal Medicine

Department of Nephrology

ETHICAL APPROVAL

Institute Ethical Committee approved the study

STUDY DESIGN

Single Center

Non randomized cross sectional study

STUDY PERIOD

Study was conducted between January 2008 and June 2008 for a period of 6 months

SAMPLE SIZE

In the study period of 6 months among the patients seen under the Department of Nephrology, after applying inclusion criteria, 333 patients were included in this study.

SELECTION OF STUDY SUBJECTS

The patients who were diagnosed as chronic kidney disease based on the National Kidney Foundation definition.

INCLUSION CRITERIA

The patients who were newly diagnosed as chronic kidney disease

CONSENT

All participates gave informed consent.

METHODOLOGY

Patients who were included in the study were evaluated by history taking, clinical examination and laboratory investigations and the information was entered based on the proforma prepared.

STATISTICAL ANALYSIS

Excel and SPSS 12 were used for data analysis

CONFLICT OF INTEREST

None

RESULTS AND OBSERVATIONS

POPULATION CHARACTERISTICS

Among the 333 patients included in the study, 217 (65.17%) were males and 116 (34.83%) were females. Majority (275; 82.59%) of the patients in the study were between 21 – 60 yrs of age.

TABLE1. AGE AND SEX DISTRIBUTION OF THE STUDY POPULATION

AGE GROUP	TOTAL	PERCENTAGE	MALE	FEMALE
≤ 20 Yrs	22	6.61	11	11
21-40 Yrs	117	35.14	63	54
40-60 Yrs	158	47.45	119	39
>60 Yrs	36	10.81	24	12
	333	100.00	217	116

AGE RANGE	MEAN	SD
8- 80 Yrs	43.81	14.87

EDUCATIONAL STATUS

In our study, 132 (39.64%) patients were illiterate, 149(44.74%) had primary education, 43 (12.91%) had secondary education, while the rest, 9 (2.7%) were graduates.

SOCIO ECONOMIC STATUS

Out of the 333, 86.48% patients in the study had family income of < Rs 5000, 13.51% between Rs 5000 and 20000, while none of the patients had a family income above Rs 20000.

BASIC ETIOLOGICAL DIAGNOSIS

Chronic glomerulonephritis was the most common diagnosis – 170 (51.05%), followed by Diabetic nephropathy - 73 (21.92%), Hypertensive nephrosclerosis - 26 (7.81%) Chronic tubulointerstitial disease - 16 (4.80%), ADPKD - 8 (2.40%), Obstructive uropathy - 4 (1.20%), Renovascular disease -2, acute cortical necrosis -1. In 33 (9.91%) patients, diagnosis could not be established with the available noninvasive investigations and were classified as having undetermined etiology.

TABLE 2. ETIOLOGICAL DIAGNOSIS

BASIC DIAGNOSIS	TOTAL	PERCENTAGE	MALE	FEMALE
CGN	170	51.05	110	60
DIAB NEPH	73	21.92	47	26
HTN NEPH	26	7.81	19	7
TID	16	4.80	10	6
ADPKD	8	2.40	6	2
OBST UROP	4	1.20	4	0
MISC	3	0.90	1	2
UNDETER	33	9.91	20	13
	333	100.00	217	116

TABLE 3. AGEWISE DISTRIBUTION OF CAUSES OF CKD

BASIC DIAGNOSIS	≤20 yrs	21-40 yrs	41-60 yrs	>60 yrs
CGN	14	88	60	8
DIAB NEPH	0	6	55	12
HTN NEPH	0	3	20	3
TID	5	4	3	4
ADPKD	0	2	6	0
OBST UROP	0	1	3	0
MISC	1	1	1	0
UNDETER	2	12	10	9
	22	117	158	36

Maximum number of Diabetic nephropathy was in the 5th and 6th decades while Chronic glomerulonephritis was more common in the 3rd and 4th decades.

DIABETES MELLITUS IN THE STUDY POPULATION

Out of 333 patients in our study, 80 (24.02%) had diabetes mellitus, of which 50 were males and 30 females.

TABLE 4. AGEWISE AND DURATIONWISE DISTRIBUTION OF DIABETES MELLITUS IN CKD

AGE GROUP	Number		DURATION OF DM	Number
≤20yrs	0		<5yrs	19
21-40yrs	6		5-10yrs	32
41-60yrs	58		10-15yrs	17
>60yrs	16		15-20yrs	9
TOTAL	80		>20yrs	3

Of the 80 diabetics, 52 (65%) were on oral hypoglycemic agents only, 18 (22.5%) were on insulin only while 10 (12.5%) were on combination treatment.

HYPERTENSION IN THE STUDY POPULATION

In our study 282 (84.68%) patients had hypertension, of which, 176 were males and 106 females. Only in 26 (7.81%) the cause of CKD was hypertensive nephrosclerosis.

TABLE5. AGEWISE AND DURATIONWISE DISTRIBUTION OF HYPERTENSION IN CKD

AGE GROUP	Number		DURATION OF HTN	Number
≤20yrs	14		<5yrs	226
21-40yrs	103		5-10yrs	38
41-60yrs	137		10-15yrs	15
>60yrs	28		15yrs	3
Total	282		Total	282

While 29 (10.28%) out of the 282 were not on any treatment for hypertension, 94 (33.33%) were on 1 drug, 146 (51.77%) on 2 drugs and 13 (4.61%) were on 3 anti-hypertensive drugs. In the study, 60 (18.02%) patients were on ACE inhibitors or ARBs.

CARDIOVASCULAR DISEASE IN THE STUDY POPULATION

Among the 333 patients included in the study, 167 (50.15%) were found to have some form of cardiovascular disease, of which 120(71.86%) were males and 47(28.14%) were females.

Among the patients with cardiovascular disease, 83.93% had left ventricular hypertrophy, 16.17% had ischemic heart disease and 7.78% had congestive heart failure. 8 patients had ischemic heart disease or congestive heart failure or both in addition to left ventricular hypertrophy.

Diabetes mellitus was present in 49 (29.3%) and 159 (95.2%) had hypertension.

TABLE6. AGEWISE DISTRIBUTION OF CARDIOVASCULAR DISEASE IN CKD

AGE GROUP	NUMBER	PERCENTAGE
≤ 20yrs	6	3.59
21-40yrs	53	31.74
41-60yrs	89	53.29
>60yrs	19	11.38
Total	167	100

TABLE7. FAMILY HISTORY OF PREDISPOSING FACTORS FOR CKD

	F/H DM	F/H HTN	F/H CKD	F/H CVD
Yes	29	43	4	0
No	304	290	329	333

Of the 4 patients with family history of CKD, 2 were diagnosed to have ADPKD. Chronic glomerulonephritis was the diagnosis in the other 2 patients.

TABLE8. HABITS IN THE STUDY POPULATION

HABIT	NUMBER	PERCENTAGE	MALE	FEMALE
Smoking	109	32.73	106	3
Chewing Tobacco	23	25.86	12	11
Alcohol	86	6.91	86	0
NSAID use	17	5.10	10	7
Herbominerals	15	4.50	12	3

PRESENTING SYMPTOMS OF THE STUDY POPULATION

Of the 333 patients, 242 (72.67%) had symptoms suggestive of volume overload state like pedal edema, puffiness of face, abdominal distension. Oliguria was present in 231 (69.36%) and 252 (75.68%) had dyspnea. Gastrointestinal symptoms like nausea, vomiting, decreased appetite were present in 223 (66.97%), while neuromuscular symptoms like headache, cramps, paresthesia were among the complaints in 168 (50.45%). Lower urinary tract complaints like dysuria, poor urinary stream, urgency, hesitancy were present in 25 (7.5%) and pruritus in 11 (3.3%) patients, while no patient in the study had any bleeding manifestation as the presenting complaint.

TABLE9. PRESENTING SYMPTOMS

PRESENTING COMPLAINT	NUMBER	PERCENTAGE
Volume Overload	242	72.67
Oliguria	231	69.36
Dyspnea	252	75.68
GI Symptoms	223	66.97
Neuromuscular	168	50.45
LUTS	25	7.5
Pruritus	11	3.3

CURRENT MANAGEMENT

In this study, 182(54.65%) patients were managed conservatively and 136(40.84%) were given dialysis. Peritoneal dialysis(83.82%) was the most common mode of dialysis provided.

TABLE10. CURRENT MANAGEMENT

TREATMENT	NUMBER	PERCENTAGE
Conservative	182	54.65
Dialysis	136	40.84
Transplant	15	4.50
TOTAL	333	100.00

TABLE11. MODE OF DIALYSIS

MODE OF DIALYSIS	NUMBER	PERCENTAGE
Peritoneal	114	83.82
Hemodialysis	22	16.17
TOTAL	136	100.00

CKD STAGE AT PRESENTATION

Majority of the patients in the study – 264(79.28%) presented in stage 5 CKD. The mean GFR in the study population, calculated by MDRD formula, was 10.81±6.92.

TABLE12. CKD STAGE AT PRESENTATION

CKD STAGE	NUMBER	PERCENTAGE	MALE	FEMALE
3	9	2.70	5	4
4	60	18.02	39	21
5	264	79.28	173	91
TOTAL	333	100.00	217	116

TABLE13. AGEWISE DISTRIBUTION OF CKD STAGE

AGE	STAGE 3	STAGE 4	STAGE 5
≤20yrs	4	4	14
21-40yrs	1	21	95
41-60yrs	3	29	126
>60yrs	1	6	29
TOTAL	9	60	264

HEMOGLOBIN IN THE STUDY POPULATION

The mean hemoglobin in the study population was 8.42±2.20 g/dl varying within a range of 4g/dl to 16.8g/dl. Anemia (hemoglobin less than 11g/dl) was present in 301 (90.39%) while 85 (25.53%) had hemoglobin less than 7g/dl.

TABLE14. HEMOGLOBIN DISTRIBUTION

Hb (g/dl)	NUMBER	PERCENTAGE	MALE	FEMALE
>11	32	9.61	24	8
7-11	216	64.86	141	75
<7	85	25.53	52	33
TOTAL	333	100.00	217	116

TABLE15. AGEWISE DISTRIBUTION OF HEMOGLOBIN IN CKD

	AGE GROUP				
Hb (g/dl)	≤20yrs	21-40yrs	41-60yrs	>60yrs	TOTAL
>11	3	7	14	8	32
7-11	12	73	114	17	216
<7	6	38	30	11	85

S. PHOSPHATE IN THE STUDY POPULATION

Mean S.Phosphate of the study population is 5.94±1.21, varying within a range of 2.8 to 11.9. S.Phosphate was less than 4.7mg/dl only in 12.91%.

TABLE16. DISTRIBUTION OF S.PHOSPHATE IN THE STUDY POPULATION

S.PHOS (mg/dl)	NUMBER	PERCENTAGE	MALE	FEMALE
<4.7	43	12.91	31	12
4.7-6.5	192	57.59	128	64
>6.5	98	29.46	58	40
TOTAL	333	100.00	216	117

STAGEWISE DISTRIBUTION OF HEMOGLOBIN LEVELS

Mean hemoglobin in Stage 3 was 9.167mg/dl, 10.195mg/dl in Stage 4 and 7.993 mg/dl in Stage 5. Anemia (hemoglobin less than 11g/dl) was present in 66.6% in Stage 3, 75% in Stage 4 and 94.7% in Stage 5.

TABLE17. STAGEWISE DISTRIBUTION OF HEMOGLOBIN LEVELS

	STAGE 3	STAGE 4	STAGE 5	OVERALL
Mean Hb(g/dl)	9.167	10.195	7.993	8.42

Hb(g/dl)	STAGE 3	STAGE 4	STAGE 5
>11	3 (33.3%)	15 (25.0%)	14 (5.3%)
7-11	2 (22.2%)	40 (66.7%)	174 (65.9%)
<7	4 (44.4%)	5 (8.3%)	76 (28.8%)
TOTAL	9 (100%)	60 (100%)	264 (100%)

$p < 0.0005$

Correlation between the hemoglobin level and the CKD stage is highly significant.

Correlation coefficient for Hb and GFR- 0.3657

$p < 0.0005$ (highly significant)

STAGEWISE DISTRIBUTION OF S.PHOSPHATE LEVELS

Mean S.Phosphate was 4.786% in Stage 3, 5.39 in Stage 4 and 6.1312 in Stage 5. In Stage 3, percentage of patients with S.Phosphate more than or equal to 4.7mg/dl was 55.5, 66.67% in Stage 4 and 93.55% in Stage 5.

TABLE18. STAGEWISE DISTRIBUTION OF S.PHOSPHATE LEVELS

	STAGE 3	STAGE 4	STAGE 5	OVERALL
Mean S.Phos (mg/dl)	4.786	5.39	6.1312	5.94

S.PHOS (mg/dl)	STAGE 3	STAGE 4	STAGE 5
<4.7	4 (44.4%)	20 (33.33%)	17 (6.44%)
4.7-6.5	5 (55.5%)	27 (45.0%)	160 (60.6%)
>6.5	0 (0%)	13 (21.67%)	87 (32.95%)
TOTAL	9 (100%)	60 (100%)	264 (100%)

$p < 0.005$

Correlation between S.Phosphorus and CKD stage is highly significant.

Correlation coefficient for S.Phosphorus and GFR is -.3580

$p < 0.0005$ (highly significant)

TABLE19. CORRELATION OF HEMOGLOBIN LEVELS WITH ETIOLOGICAL DIAGNOSIS

	ETIOLOGICAL DIAGNOSIS				
Hb (g/dl)	CGN	DIAB NEPH	HTN NEPH	NON-GLOMERULAR	UNDETER-MINED
<7	46(26.9%)	15(20.5%	7(24.8%)	10(11.8%)	7(21.2%)
7-11	112(66.1%)	51(69.9%)	14(53.8%)	17(56.3%)	22(66.7%)
>11	12(7.0%)	7(9.6%)	5(21.4%)	4(12.5%)	4(12.1%)
TOT	170(100%)	73(100%)	26(100%)	31(100%)	33(100%)

p = .42666

Correlation between hemoglobin levels and the etiological diagnosis is not significant.

TABLE20. CORRELATION OF S.PHOSPHATE LEVELS WITH ETIOLOGICAL DIAGNOSIS

	ETIOLOGICAL DIAGNOSIS				
S.PHOS (mg/dl)	CGN	DIAB NEPH	HTN NEPH	NON-GLOMERULAR	UNDETER-MINED
<4.7	27(15.8%)	7(9.6%)	0	5(16.1%)	4(12.1%)
4.7-6.5	91(53.8%)	46(63%)	14(53.8%)	18(58.1%)	22(66.7%)
>6.5	52(30.4%)	20(27.4%)	12(46.2%)	8(25.8%)	7(21.2%)
TOT	170(100%)	73(100%)	26(100%)	31(100%)	33(100%)

p = .44358

Correlation between S.Phosphate levels and the etiological diagnosis is not significant.

TABLE21. CORRELATION BETWEEN THE CKD STAGE AT PRESENTATION AND THE ETIOLOGICAL DIAGNOSIS

	ETIOLOGICAL DIAGNOSIS				
STAGE	CGN	DIAB NEPH	HTN NEPH	NON-GLOMERULAR	UNDETER-MINED
3	4(2.3%)	1(1.4%)	0	3(9.7%)	1(3%)
4	29(17%)	12(16.4%)	3(11.5%)	6(19.4%)	10(30.3%)
5	137(80.7%)	60(82.2%)	23(88.5%)	22(70.9%)	22(66.7%)
TOT	170(100%)	73(100%)	26(100%)	31(100%)	33(100%)

p = .13855

Correlation between the stage at presentation and the etiological diagnosis is not significant.

CORRELATION BETWEEN CARDIOVASCULAR DISEASE AND AGE

Cardiovascular disease in the study population was least in the age group less than or equal to 20 years (27.3%), while it was present in 56.3% of patients in the age group 41-60 years.

TABLE22. CORRELATION BETWEEN CARDIOVASCULAR DISEASE AND AGE

	AGE GROUP			
CVD	≤20yrs	21-40yrs	41-60yrs	>60yrs
Yes	6 (27.3%)	53 (45.3%)	89 (56.3%)	19 (52.8%)
No	16 (72.7%)	64 (54.7%)	69 (43.7%)	17 (47.2%)
TOTAL	22 (100%)	117 (100%)	158 (100%)	36(100%)

p = .04169

There is a significant correlation between cardiovascular disease and the age in the study population.

TABLE23.CORRELATION BETWEEN CARDIOVASCULAR DISEASE AND THE ETIOLOGICAL DIAGNOSIS

	ETIOLOGICAL DIAGNOSIS				
CVD	CGN	DIAB NEPH	HTN NEPH	NON-GLOMERULAR	UNDETER-MINED
Yes	79 (46.2%)	48(65.8%)	22(84.6%)	9(29.0%)	9(27.3%)
No	91 (53.8%)	25(34.2%)	4(15.3%)	22(71.0%)	24(72.7%)
TOT	170(100%)	73(100%)	26(100%)	31(100%)	33(100%)

$p < .0005$

The correlation between cardiovascular disease and the etiological diagnosis is highly significant.

Cardiovascular disease was more common when the cause of CKD was Diabetic nephropathy (65.8%) or Hypertensive nephrosclerosis(84.6%).

TABLE24. CORRELATION BETWEEN CARDIOVASCULAR DISEASE AND DIABETES MELLITUS

	DM	
CVD	Yes	No
Yes	49 (61.2%)	118 (46.6%)
No	31 (38.8%)	135 (53.4%)
TOTAL	80 (100%)	253 (100%)

p = .02273

There is a significant correlation between presence of cardiovascular disease and Diabetes mellitus in the study population.

TABLE25. CORRELATION BETWEEN CARDIOVASCULAR DISEASE AND HYPERTENSION

	HTN	
CVD	Yes	No
Yes	159 (56.4%)	8 (15.7%)
No	123 (43.6%)	43 (84.3%)
TOTAL	282 (100%)	51 (100%)

$p < 0.0005$

The correlation between presence of cardiovascular disease and hypertension is highly significant in the study population.

TABLE26. CORRELATION OF CARDIOVASCULAR DISEASE AND HEMOGLOBIN LEVELS

	Hb (g/dl)		
CVD	<7	7-11	>11
Yes	52 (61.2%)	90 (41.7%)	25 (78.1%)
No	33 (38.8%)	126 (58.3%)	7 (21.9%)
TOTAL	85 (100%)	216 (100%)	32 (100%)

p= .00004

The correlation between the presence of cardiovascular disease and the hemoglobin levels is highly significant in the study population.

TABLE27. CORRELATION OF CARDIOVASCULAR DISEASE AND S.PHOSPHATE LEVELS

	S.Phos (mg/dl)		
CVD	<4.7	4.7-6.5	>6.5
Yes	16 (37.2%)	107 (55.7%)	64 (65.3%)
No	27 (62.7%)	85 (44.3%)	34 (34.7%)
TOTAL	43 (100%)	192 (100%)	98 (100%)

p = .00225

The correlation between the presence of cardiovascular disease and the S.Phosphate levels is highly significant in the study population.

TABLE28. CORRELATION OF CARDIOVASCULAR DISEASE WITH CKD STAGE

CVD	STAGE 3	STAGE 4	STAGE 5
Yes	4 (44.4%)	32 (53.3%)	131 (49.6%)
No	5 (55.6%)	28 (46.7%)	133 (50.4%)
TOTAL	9 (100%)	60 (100%)	264 (100%)

p = .82286

There is no significant correlation between the presence of cardiovascular disease and the CKD stage at presentation in the study population.

FIGURE 1. AGE DISTRIBUTION

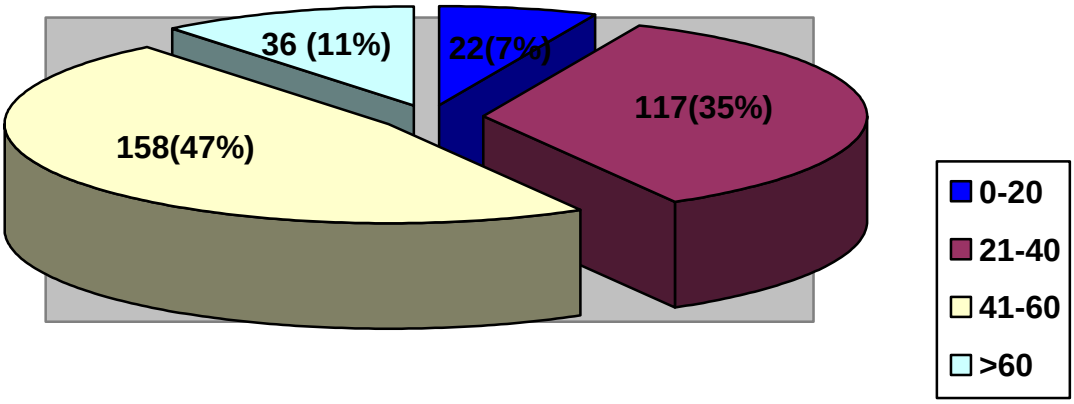


FIGURE 2. SEX DISTRIBUTION

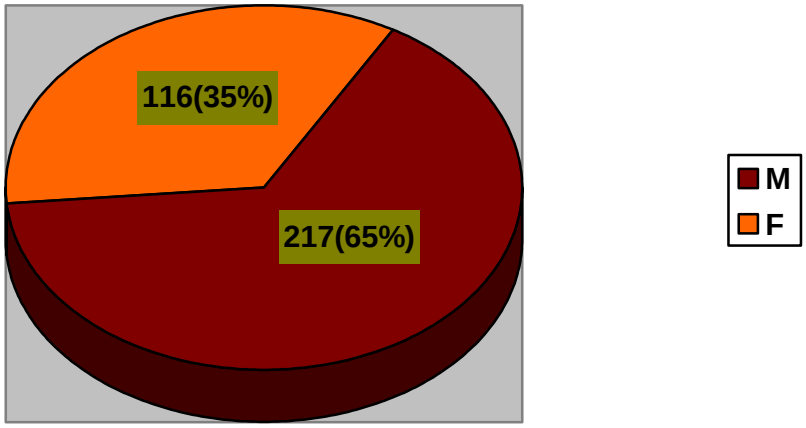


FIGURE 3. ETIOLOGICAL DIAGNOSIS

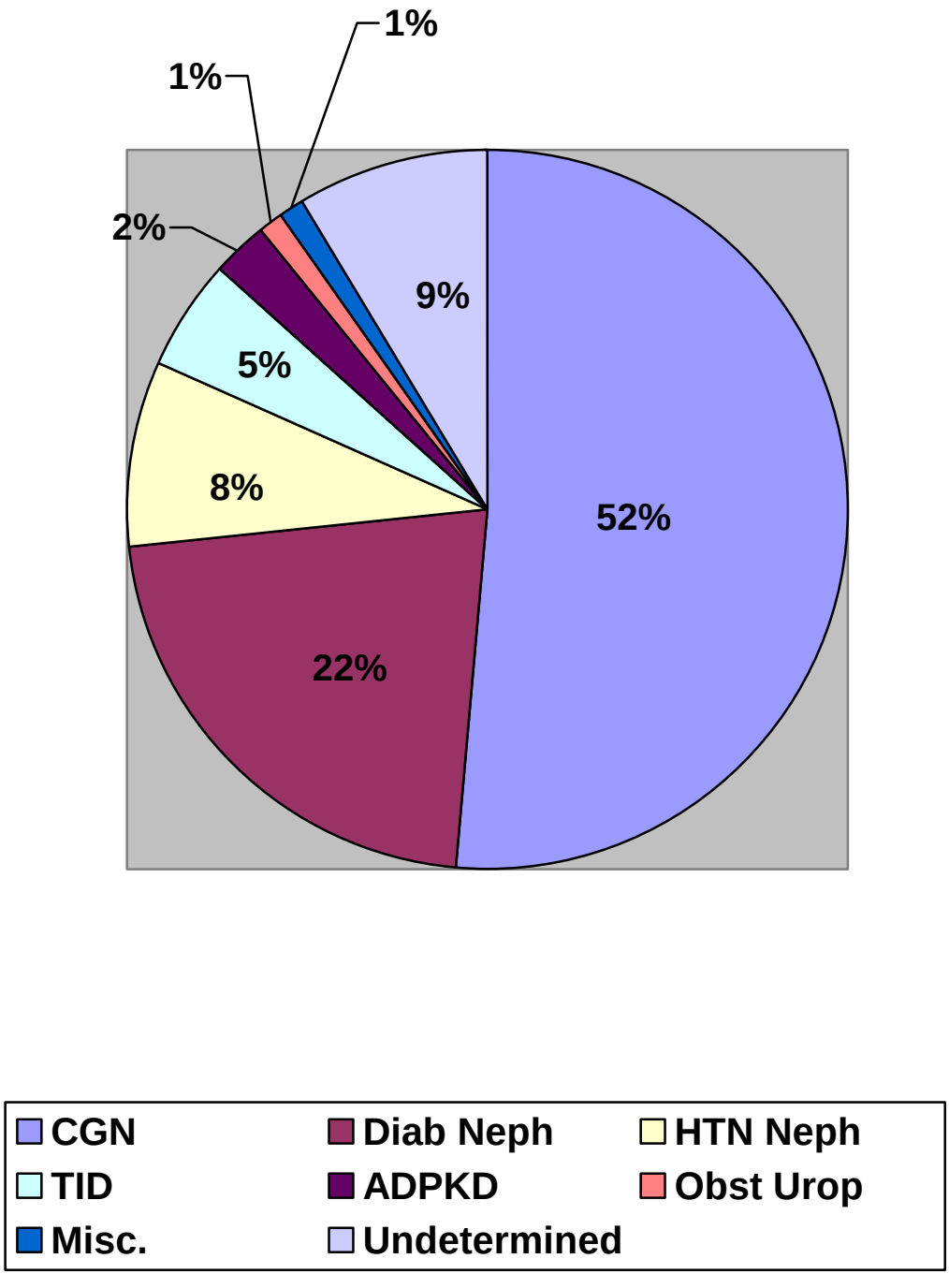
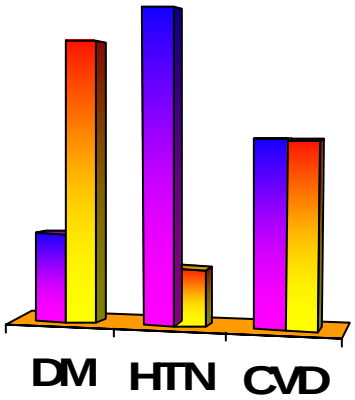


FIGURE4. DIABETES MELLITUS, HYPERTENSION AND CARDIOVASCULAR DISEASE IN THE STUDY POPULATION



	DM	HTN	CVD
YES	80	282	167
NO	253	51	166

FIGURE 5. AGEWISE DISTRIBUTION OF DM, HTN & CVD

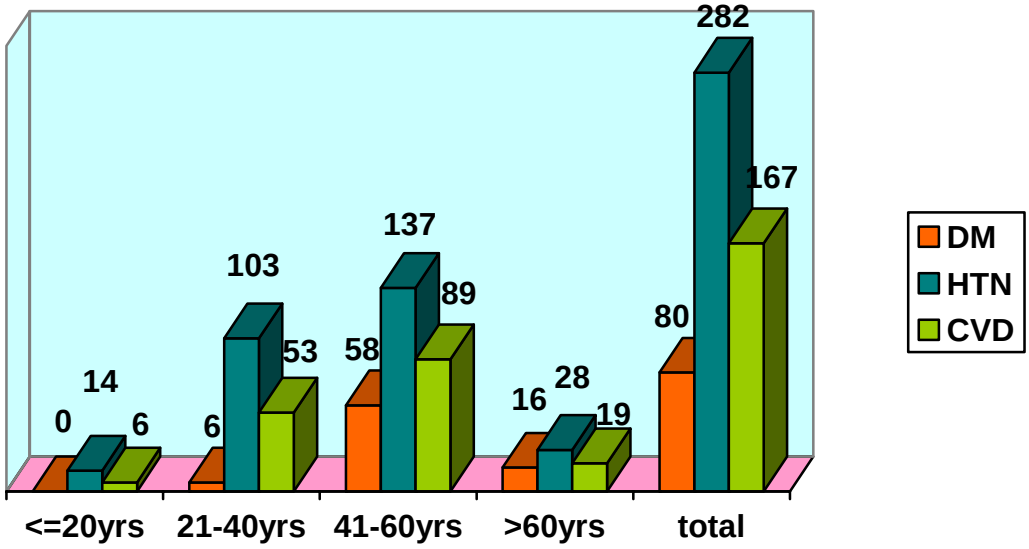
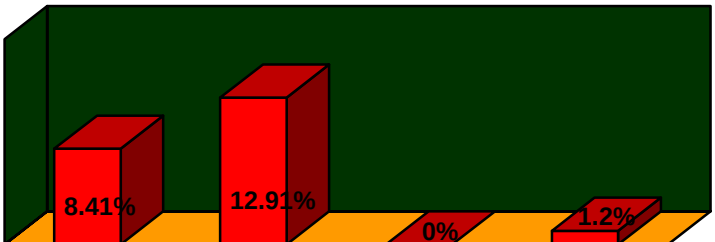
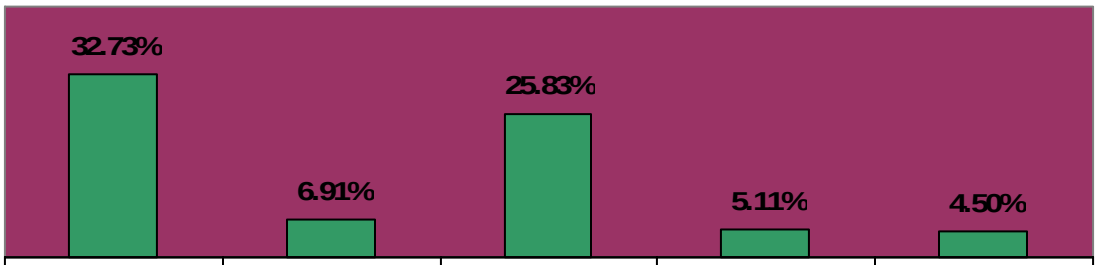


FIGURE 6. FAMILY HISTORY OF DM, HTN, CVD AND CKD IN THE STUDY POPULATION



DM	HTN	CVD	CKD
28	43	0	4

FIGURE 7. HABITS IN THE STUDY POPULATION



Smoking	Chewing tobacco	Alcohol	NSAIDS	Herbominerals
109	23	86	17	15

FIGURE 8. HEMOGLOBIN DISTRIBUTION

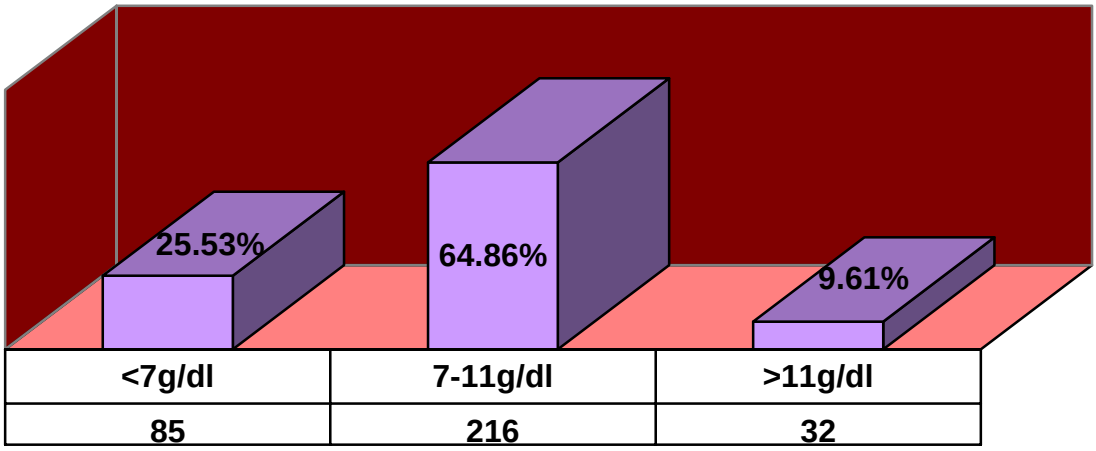


FIGURE 9. DISTRIBUTION OF S.PHOSPHATE (mg/dl)

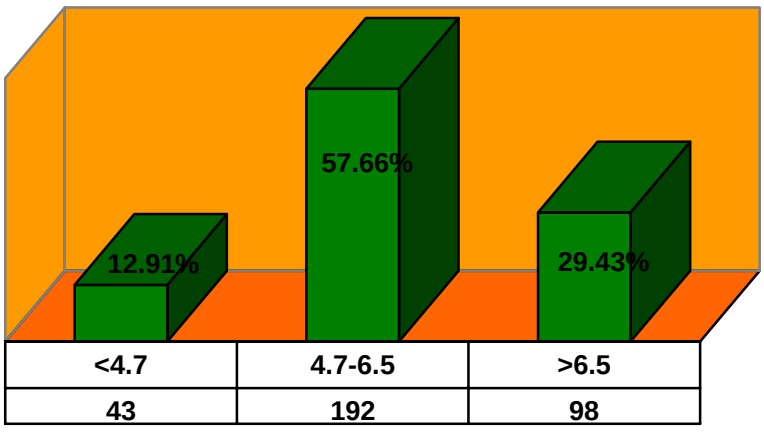


FIGURE 10. PRESENTING SYMPTOMS

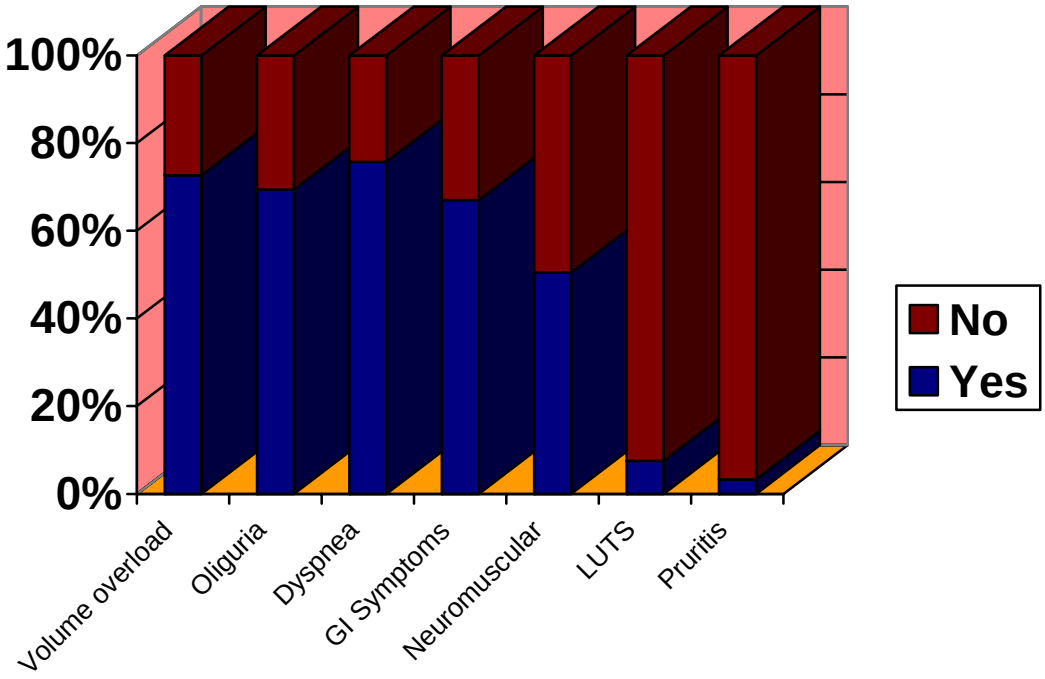


FIGURE 11. CURRENT MANAGEMENT

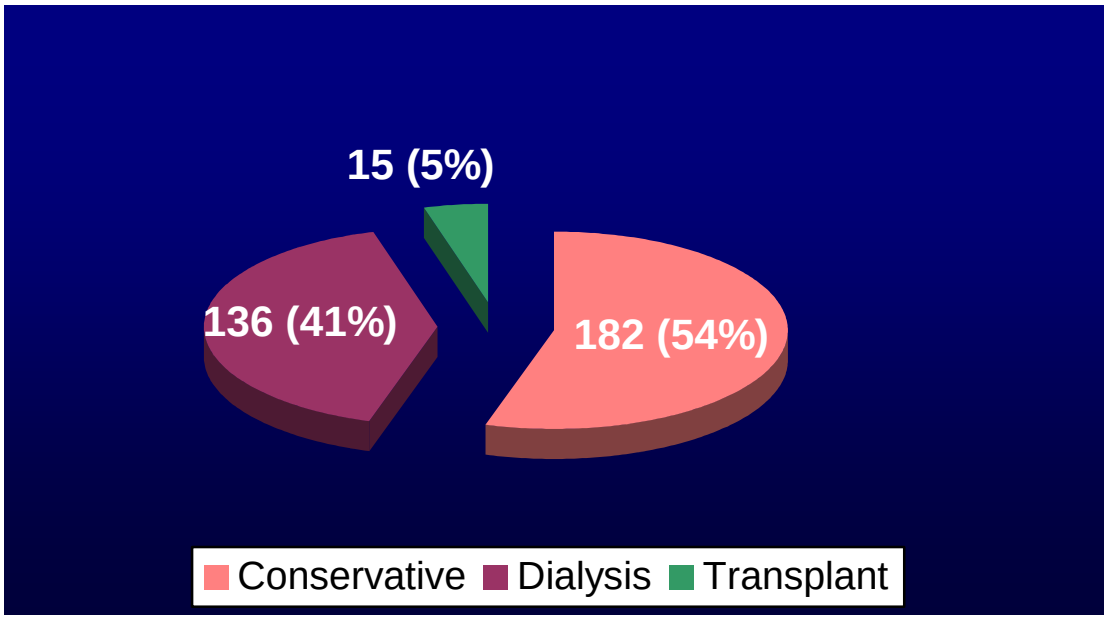


FIGURE 12.MODE OF DIALYSIS

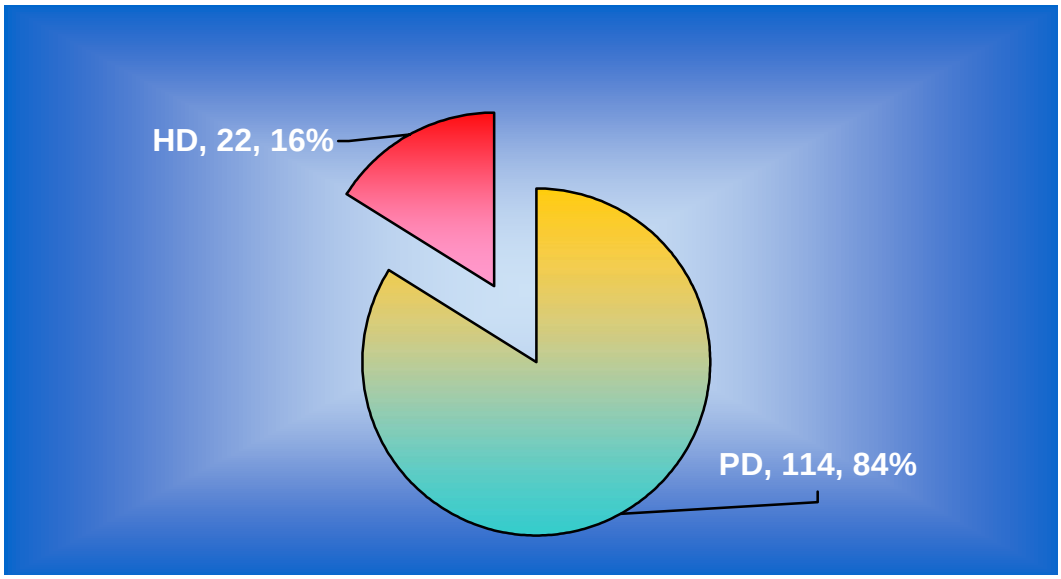


FIGURE 13.CKD STAGE (MDRD) AT PRESENTATON

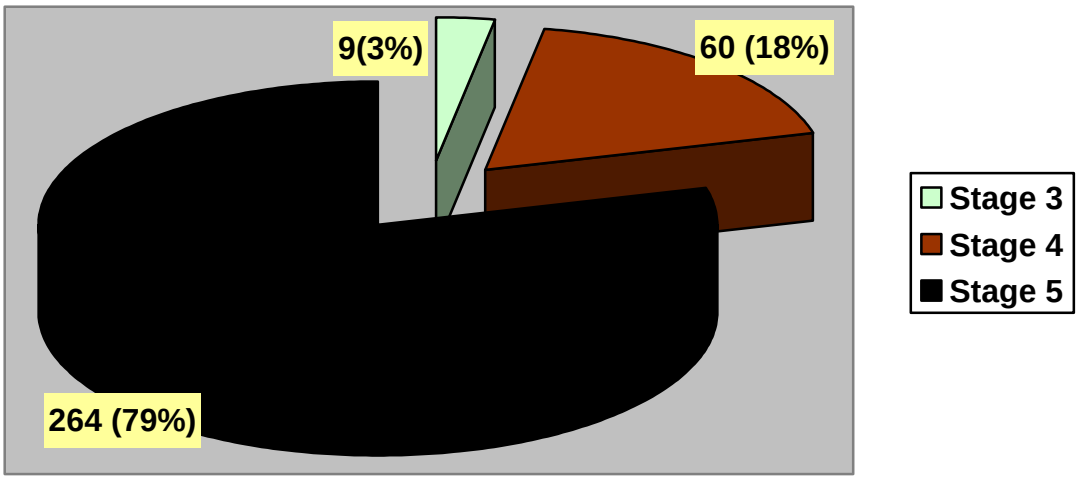


FIGURE 14.STAGEWISE DISTRIBUTION OF CVD

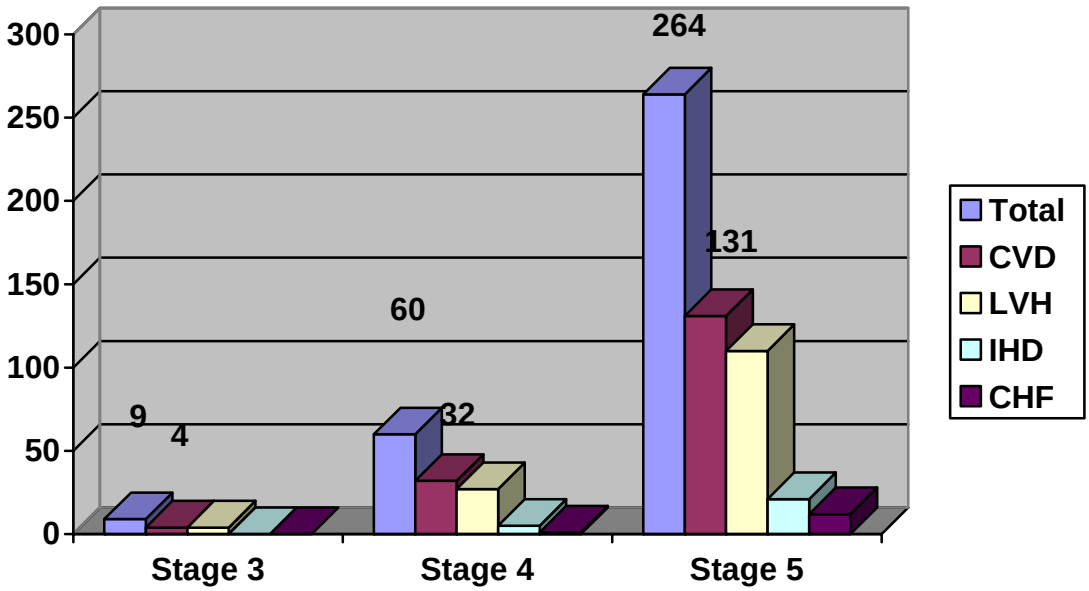


FIGURE 15.CKD STAGEWISE MEAN HEMOGLOBIN (g/dl)

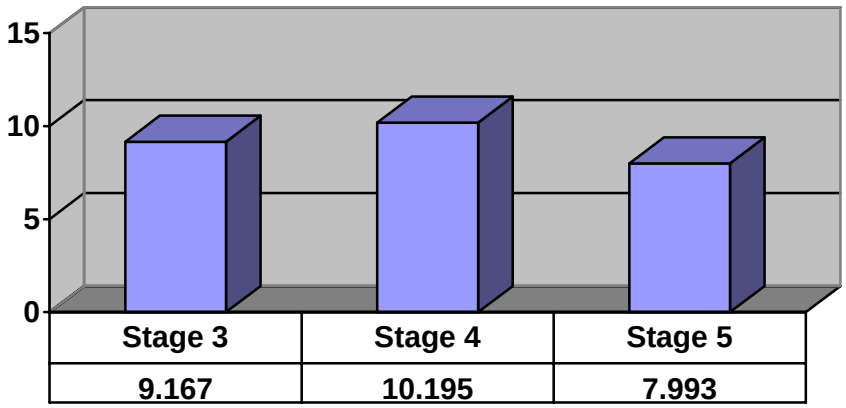


FIGURE 16.STAGEWISE HEMOGLOBIN (g/dl) DISTRIBUTION

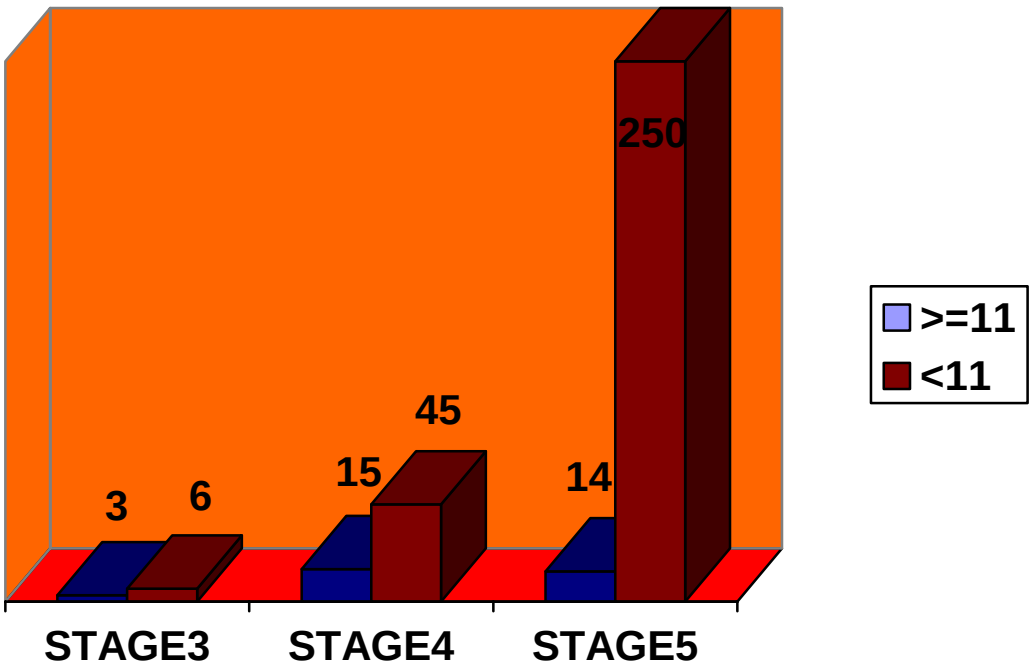


FIGURE 17.STAGEWISE MEAN S.PHOSPHATE(mg/dl)

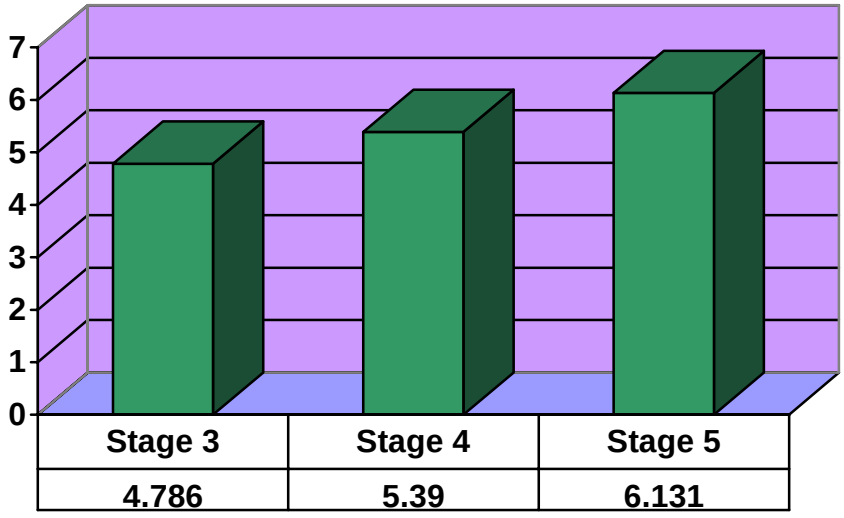
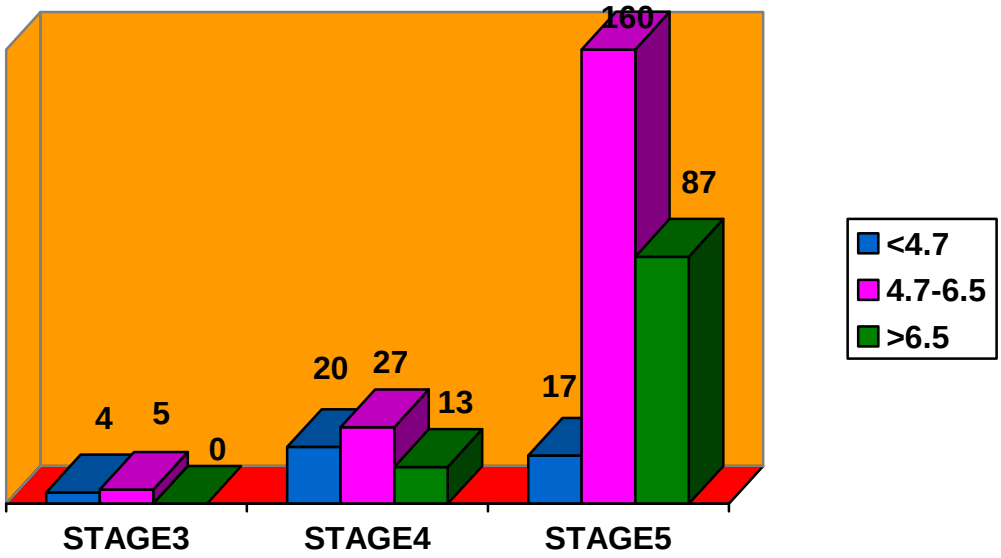


FIGURE 18. STAGEWISE S.PHOSPHATE (mg/dl) DISTRIBUTION



DISCUSSION

The centre where the study has been conducted is a Government setup where a live kidney donor transplant program is functioning and a routine maintenance hemodialysis facility is absent. Almost all the patients with chronic kidney disease who are admitted are given peritoneal dialysis. If the patient is suitable for transplant and live donor is available, he is registered under the transplant program and given maintenance hemodialysis awaiting transplant.

AGE AND GENDER

In our study of 333 patients with CKD, 65.17% were males, which is consistent with the CKD Registry of India Report[77] where males constituted 68.9% of the total CKD patients and CMC Vellore Study[79] where 62% were males, probably reflect the faster decline in GFR in males as compared to females due to hormonal influence. Majority of the patients were in the group 41-60years, with a mean age of 43.81±14.87 years. The mean age in CKD Registry of India Report[77] is 48.3±16.6 years and CMC, Vellore study[79] 38.2±14.5 years.

EDUCATION AND SOCIOECONOMIC STATUS

In our study, out of the 333 patients, 84.38% of the patients were illiterate or just had primary education and all the patients were in low socioeconomic group with 84.68% having monthly family income < Rs.5000. Though relation of low socioeconomic and educational status with CKD has already been found in previous related studies, it cannot be inferred from our study because we cater to patients with low socioeconomic status.

CAUSE

Chronic glomerulonephritis was the commonest cause of CKD in our study -170 (51.05%) which is consistent with the study done in CMC,Vellore[79] where CGN was the diagnosis in 70.5% excluding Diabetic nephropathy. Diabetic nephropathy (21.92%), Hypertensive nephrosclerosis (7.81%) and Tubulointerstitial disease(4.8%) were the other causes of CKD in that order, with 9.91% having undetermined etiology. Thus even with the epidemic of noncommunicable disease like diabetes and hypertension, and increasing incidence of CKD due to these diseases in developing countries, chronic glomerulonephritis continues to be the most common cause.

DIABETES AND CKD

In patients with Diabetes mellitus, 63.75% had a known duration less than 10 years and 23.75%, less than 5 years. In the CKD Registry of India Report[77], 40.7% of diabetics had duration less than 10 years and 16.9% less than 5 years. This emphasizes the importance of checking for microalbuminuria and proteinuria at the time of diagnosis of type 2 DM.

HYPERTENSION AND CKD

While 282 (84.68%) had hypertension, only in 28 (8.41%) was CKD due to Hypertensive nephrosclerosis. According to the CKD registry of India Report[77], 71% had hypertension, while Hypertensive nephrosclerosis was the cause of CKD in only 19.8%.

FAMILY HISTORY OF RISK FACTORS

Family history of DM (29;8.71%), hypertension (43;12.91%) and CKD(4;1.2%) were present only in a small number of patients.

HABITS AND CKD

Cigarette smoking was prevalent in 32.73%, alcohol consumption in 6.91%, use of nephrotoxic agents like NSAIDS in 5.1% and herbominerals

in 4.5% which might have contributed to the faster progression of the disease in these patients. This is consistent with the CKD Registry of India Report[77], where cigarette smoking was prevalent in 32%, alcohol consumption in 6.4%, NSAIDS use in 2%.

SYMPTOMS

Dyspnea was the commonest symptom, observed in 75.68%, symptoms of volume overload in 72.67%, oliguria in 69.36%, gastrointestinal symptoms in 66.97% and neuromuscular symptoms in 50.45%. There needs to be a high index of suspicion of CKD even in patients presenting with symptoms related to other systems.

CURRENT TREATMENT

54.65% of the patients were managed conservatively. 45.34% received some form of renal replacement treatment, majority being peritoneal dialysis (75.49%). Only 4.5% underwent renal transplantation. These observations in our study do not concur with the CKD Registry of India Report[77] where 76.9% of the patients were managed conservatively and among the patients on dialysis, maintenance hemodialysis was the preferred mode of dialysis(86.59%). Only 2.5% patients received renal transplant.

CKD STAGE AT PRESENTATION

An overwhelming 264 (79.28%) patients in our study presented for the first time with CKD stage 5. Only 18.03% were in stage 4, 2.7% in Stage 3 and none in Stages 1 or 2, which is consistent with the observations made in the CKD Registry of India Report[77], where 50.3% presented in Stage 5, 24% in Stage 4, 19.1% in Stage 3, 4.4% in Stage 2 and 2.2% in Stage 1. This reflects the lack of awareness about CKD in the public and the failure of the medical practitioners to screen the at risk population and to diagnose CKD at an early stage, which would enable appropriate treatment to be instituted to prevent or reduce the rate of progression of CKD and bring down the huge burden due to mismatch between demand and availability of resources for renal replacement therapy in developing countries like India, especially for low socioeconomic group.

HEMOGLOBIN

The mean hemoglobin level in the study population was 8.42±2.20g/dl. 301 (90.39%) had anemia (cutoff taken as 11g/dl) , while 25.53% had a value less than 7g/dl. Prevalence of anemia increased from Stage 3 (66.6%) to stage 5 (94.7%) and the correlation was statistically significant. This is

consistent with the CKD Registry of India Report[77] where anemia was present in 32.6% of Stage 3, 57.5% of Stage 4 and 83.2% of Stage 5 patients.

The mean hemoglobin level was found to increase from stage 3 (9.167) to stage 4 (10.195) and then decrease drastically in stage 5 (7.993) probably due to less number of patients in stage 3 influencing the mean hemoglobin value. These observations do not match with the CKD Registry of India Report where mean hemoglobin levels were 10.92g/dl in Stage 3, 9.75g/dl in Stage 4 and 8.33g/dl in Stage 5.

S.PHOSPHATE

The mean S.Phosphate level in the study was 5.91±1.21mg/dl. Only 43 (12.91%) had S.Phosphate below the recommended value in CKD of 4.7mg/dl., while 98 (29.46%) had a value more than 6.5mg/dl. Mean S.Phosphate level increased from 4.786mg/dl in stage 3 to 5.39mg/dl in stage 4 and 6.1312mg/dl in stage 5, which is consistent with the observations in CKD Registry of India Report[77] where mean S.Phosphate levels were 4.54mg/dl in Stage 3, 4.93mg/dl in Stage 4 and 5.91mg/dl in Stage 5.The percentage of patients with S.Phosphate more than or equal to 4.7mg/dl

increased from 55.5% in stage 3 to 66.67% in stage 4 to 93.55% in stage 5. The correlation was found to be statistically significant.

There was no significant correlation between etiological diagnosis and hemoglobin levels, S.Phosphate levels or the stage of CKD at presentation.

CARDIOVASCULAR DISEASE

Cardiovascular disease was present in 167 (50.15%) patients, of which left ventricular hypertrophy was the commonest (141; 83.93%), while in the CKD Registry of India Report[77], ischemic heart disease (44.2%) was the commonest with left ventricular hypertrophy in 31.6%. Cardiovascular disease was more common when the etiological diagnosis was diabetic nephropathy (65.8%) or hypertensive nephrosclerosis (85.7%) and the correlation was statistically significant. The correlation of cardiovascular disease and the presence or absence of DM as well as of hypertension was statistically significant. This is consistent with the findings in CKD Registry of India.[77]

Among patients with anemia there was a higher incidence of cardiovascular disease in patients with hemoglobin less than 7g/dl (61.2%)

than those having value between 7-11g/dl (41.7%) and the correlation was statistically significant. But there was a paradoxical increase in percentage of patients with cardiovascular disease among those with value more than 11g/dl (78.1%). Because of the less number of patients in this group, whether there is an association between increased risk of cardiovascular disease and higher values of hemoglobin above 11g/dl in patients with CKD not on dialysis needs further study. Such a relation has been found in patients on dialysis given erythropoietin.[68] These observations are not consistent with those of the study done in tertiary care centre in Chennai,[80] where 82% with hemoglobin less than 7g/dl, 80% with hemoglobin between 7-11g/dl and 68% with hemoglobin more than 11g/dl had left ventricular hypertrophy.

Cardiovascular disease was also found to be more frequent when S.Phosphate was more than 6.5mg/dl (65.3%) as compared to 4.7-6.5mg/dl (55.7%) or less than 4.7mg/dl (37.2%) and the correlation was statistically significant. The correlation between cardiovascular disease and CKD stage was not statistically significant, probably indicating that risk for cardiovascular disease starts in the early stages itself.

To execute a change in the management of patients with CKD, medical students, healthcare professionals, and established physicians, need to be educated about the prevalence and consequences of CKD. The concept that CKD is a risk factor for cardiovascular disease, and needs to be managed should be emphasized. Screening of the high risk individuals (those with hypertension, diabetes mellitus, cardiovascular disease and first degree relatives of patients with hypertension, diabetes mellitus or renal disease) will maximize the detection of CKD and benefit a large population of patients.

LIMITATIONS

1. Most of the patients attending the centre of the study belong to the low socioeconomic and educational status and hence are not an accurate representation of the general population.
2. Histopathological diagnosis was lacking for most of the patients as they had contracted kidney at presentation, hence diagnosis was entirely based on clinical and laboratory criteria.
3. For 33 patients, the etiology remained undetermined.
4. Presence of cardiovascular disease was studied based on non invasive tests like ECG and echocardiogram, wherever indicated. Hence the prevalence would have been underestimated.

CONCLUSION

1. Chronic glomerulonephritis is the commonest cause of Chronic kidney disease in the study population.
2. More than three fourth of patients presented with stage 5 Chronic kidney disease for the first time.
3. Less than half of the patients received renal replacement treatment.
4. Complications like anemia and hyperphosphatemia increased with progression of stage of Chronic kidney disease.
5. Cardiovascular disease in Chronic kidney disease is more common in the presence of Diabetes mellitus, Hypertension, Hyperphosphatemia.
6. In patients with anemia, cardiovascular disease was more common when hemoglobin levels were less than 7g/dl.
7. Correlation between cardiovascular disease and stage of Chronic kidney disease could not be established in the study.

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ABBREVIATIONS

CKD	– Chronic Kidney Disease
ESRD	– End Stage Renal Disease
GFR	- Glomerular Filtration Rate
MDRD	– Modified Diet in Renal Diseases
NKF/KDOQI	– National Kidney Foundation/ Kidney Disease Outcome Quality Initiative
NHANES	– National Health And Nutritional Examination Survey
NSAID	– Non Steroidal Anti Inflammatory Drugs
CVD	– Cardiovascular Disease
LVH	– Left Ventricular Hypertrophy
IHD	– Ischemic Heart Disease
CGN	– Chronic Glomerulonephritis
MHD	– Maintenance Hemodialysis
CAPD	– Continous Ambulatory Peritoneal Dialysis
PTH	- Parathormone

LIST OF TABLES

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PROFORMA

CHRONIC KIDNEY DISEASE

NAME: NEPHRO. NO:
AGE: DATE:
SEX: EDUCATION:
MONTHLY FAMILY INCOME:

HISTORY
Presenting Complaints

Symptom		Duration	Symptom		Duration
B/l leg swelling			Anorexia		
POF			Nausea		
Oliguria			Vomiting		
Polyuria			Hiccups		
Nocturia			Diarrhea		
Hematuria			Fever		
Dyspnoea			Abd pain		
Chest pain			Loin pain		
Headache			Pain on voiding		
Sleep disturbance			Difficulty in voiding		
Weakness			Urgency		
Numbness			Hesitancy		
Paresthesia			Urinary stream		
Muscle cramps			Skin rash		
Joint pain			Itching		
Bleeding any site			Deafness		

Past History

	Duration	Rx
HTN		
DM		
IHD		

Family History

HTN		CKD	
DM		CAD	

Drug History

	Duration		Duration
ACEI		Alcohol	
NSAIDS		Tobacco	
Native medicine		Other nephrotoxic drugs	

PHYSICAL EXAMINATION

Consciousness		Pallor		Wt	
Orientation		Icterus		Hydration	
PR		Cyanosis		JVP	
BP		Clubbing			
RR		Lymphnodes		P/ A	
Temp		Tongue		CVS	
Postural fall in BP		Skin turgor		RS	
Stomatitis		Pedal edema		CNS	
Glossitis		Periorbital edema			

INVESTIGATIONS

Urine				Hb			
Osmolality				PCV			
Ph				TLC			
Proteins				DLC			
Sugar				ESR			
Cells				PLT			
Casts				B.Urea			
Protein				S.Creat			
Creat				S.Na			
PCR				S.K			
Culture				B.Sugar			

T.Bil		S.Uric acid		pH	
OT/PT		S.Phosph		pCO_2	
S.A.P		S.Ca		HCO_3	
T.P/Alb		S.PTH		Cl	
T.Chol					

ECG

CXR

USG KUB

ECHO

PREVIOUS ADMISSIONS

Diagnosis -
Treatment given –

CALCULATED GFR - CG formula Stage -
MDRD formula Stage -

TREATMENT

Medication Dialysis Transplant

OUTCOME
Symptoms controlled with medication alone ( )
Requires dialysis intermittently ( )
Transplant indicated – donor – available ( ) not available ( )
Post transplant state ( )
Death ( )
Lost for follow up ( )

PATIENT CONSENT FORM

STUDY TITLE:
"A STUDY ON CAUSES, CLINICAL & BIOCHEMICAL PROFILE, COMPLICATIONS AND OUTCOME IN PATIENTS WITH CHRONIC KIDNEY DISEASE IN GGH, CHENNAI"

Study centre : Institute of Internal Medicine and Department of Nephrology Madras Medical College

Patient's Name : _____

Patient's Age : _____

Identification No. : _____

Patient's may (√) these boxes

I confirm that I have understood the purpose of procedure of the above study. I have had the opportunity to ask questions and all my questions and doubts have been answered to complete satisfaction. ☐

I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving any reason, without my legal rights being affected. ☐

I understand that the sponsor of this clinical study, others working on the sponsor's behalf, the ethics committee and the regulatory authorities will not need my permission to look at my heath records both in respect to the current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I agree to this access. However, I understand that my identity will not be reealed in any information released to third parties, or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study. ☐

I agree to take part in the above study and to comply with instructions given during the study and to co-operate with the study team, and to immediately inform the study staff if I suffer from any deterioration of health or any unexpected or unusual symptoms. ☐

I hereby consent to participate in this study on "A Study on the Causes, Clinical & Biochemical profile, Complications and Outcome in patients with Chronic Kidney Disease in GGH, Chennai". I hereby give permission to undergo complete clinical examination, and diagnostic tests. ☐

Signature/Thumb impression _____ Place_____ Date_____
of the patient

Patient's Name and Address _____

_____

Signature of the Investigator _____ Place_____ Date_____

Study Investigator's Name _____